Exam: Function Reflections (Solution version 602)

1. (worth 9 points) Let function f be defined by the polynomial below:

$$f(x) \ = \ 9x^4 + 3x^3 + 6x^2 + 4x - 5$$

Draw lines that match each function reflection with its polynomial:

Reflections	Polynomials

$-f(x)$ ●   ● $9x^4 - 3x^3 + 6x^2 - 4x - 5$

$f(-x)$ ●   ● $-9x^4 - 3x^3 - 6x^2 - 4x + 5$

$-f(-x)$ ●   ● $-9x^4 + 3x^3 - 6x^2 + 4x + 5$

2. (worth 20 points) In each xy plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The x axis is horizontal and the y axis is vertical (as typical), and the scale is equal on both axes.

- $y = g(x)$
- $y = -g(-x)$

- $y = h(x)$
- $y = h^{-1}(x)$

- $y = m(x)$
- $y = -m(x)$

- $y = p(x)$
- $y = p(-x)$
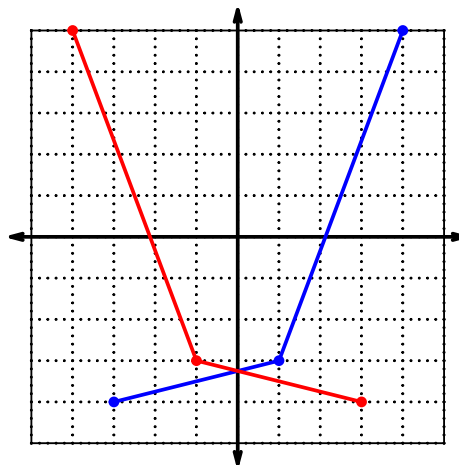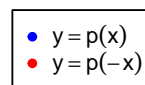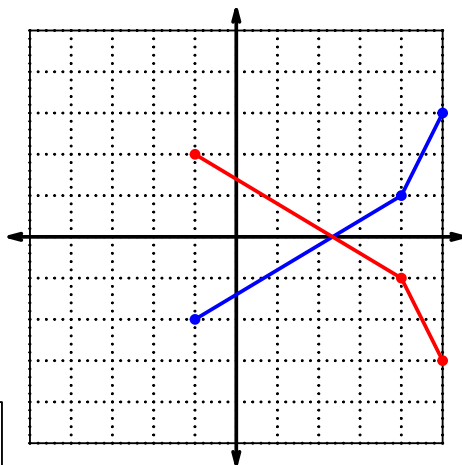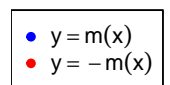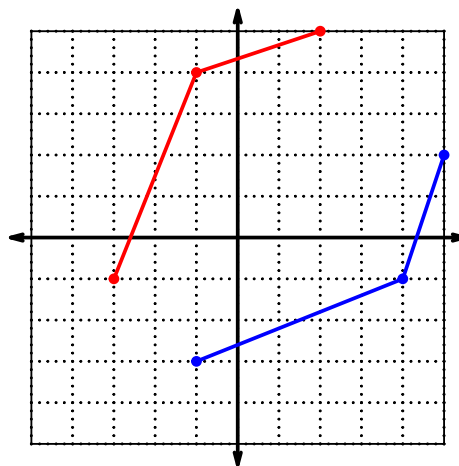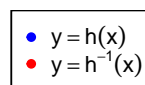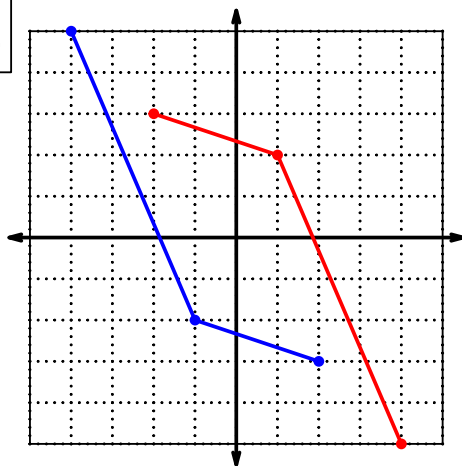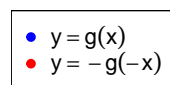
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For all questions on this page, the functions f, g, and h are defined by the table below.

x	$f(x)$	$g(x)$	$h(x)$
1	7	5	4
2	9	7	1
3	4	2	8
4	5	9	7
5	1	6	5
6	2	3	6
7	3	8	9
8	6	1	2
9	8	4	3

3. (worth 3 points) Evaluate $h(9)$.

$$h(9) = 3$$

4. (worth 3 points) Evaluate $f^{-1}(6)$.

$$f^{-1}(6) = 8$$

5. (worth 3 points) Assuming g is an **odd** function, evaluate $g(-2)$.

If function g is odd, then
$$g(-2) = -7$$

6. (worth 3 points) Assuming f is an **even** function, evaluate $f(-7)$.

If function f is even, then
$$f(-7) = 3$$

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7. (worth 15 points) A function, f, is **even** if $f(x) = f(-x)$ for all x in the domain. A function, g, is **odd** if $g(x) = -g(-x)$ for all x in the domain.

   Let polynomial p be defined with the following equation:

   $$p(x) = -x^2 - 1$$

   a. Express $p(-x)$ as a polynomial in standard form.

   $$p(-x) = -(-x)^2 - 1$$
   $$p(-x) = -x^2 - 1$$

   b. Express $-p(-x)$ as a polynomial in standard form.

   $$-p(-x) = -\left(-x^2 - 1\right)$$
   $$-p(-x) = x^2 + 1$$

   c. Is polynomial p even, odd, or neither?

   even

   d. Explain how you know the answer to part c.

   We see that $p(x) = p(-x)$ for all x because $p(x)$ and $p(-x)$ are equivalent polynomials. Thus function p satisfies the criterion for being an even function.

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8. (worth 10 points) I have drawn half of a function. Draw the other half to make it even or odd.

EVEN

ODD
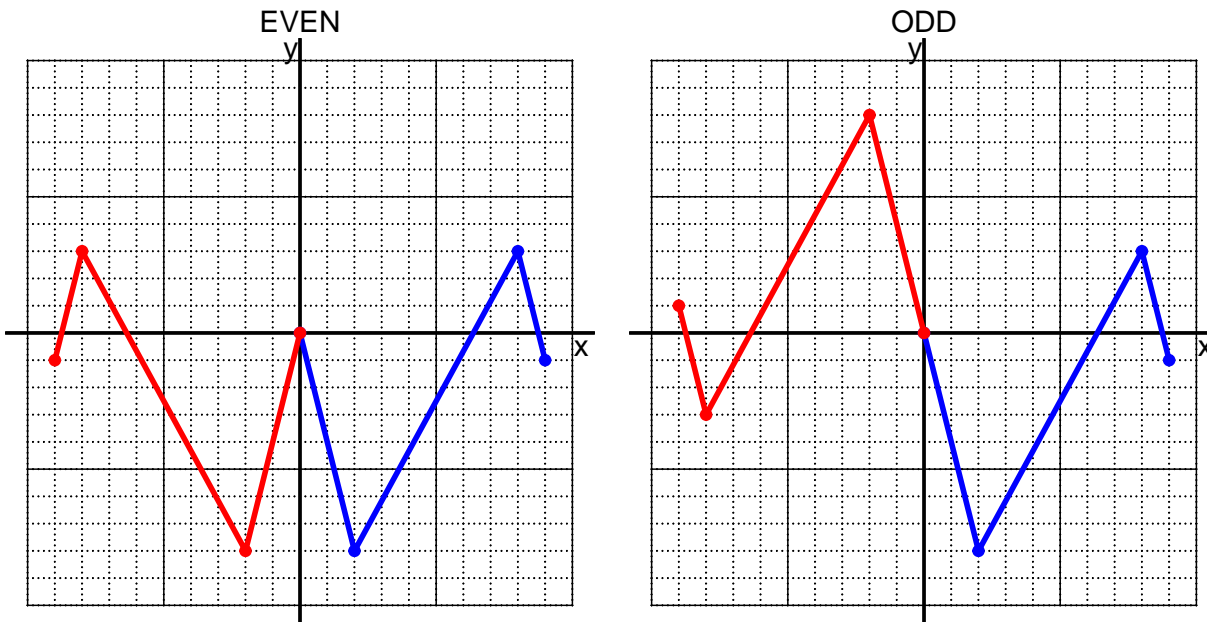
9. (worth 10 points) Let function f be defined with the equation below.

$$f(x) = 3x + 8$$

a. Evaluate $f(2)$.

step 1: multiply by 3
step 2: add 8

$$\color{red}f(2) = 3(2) + 8$$
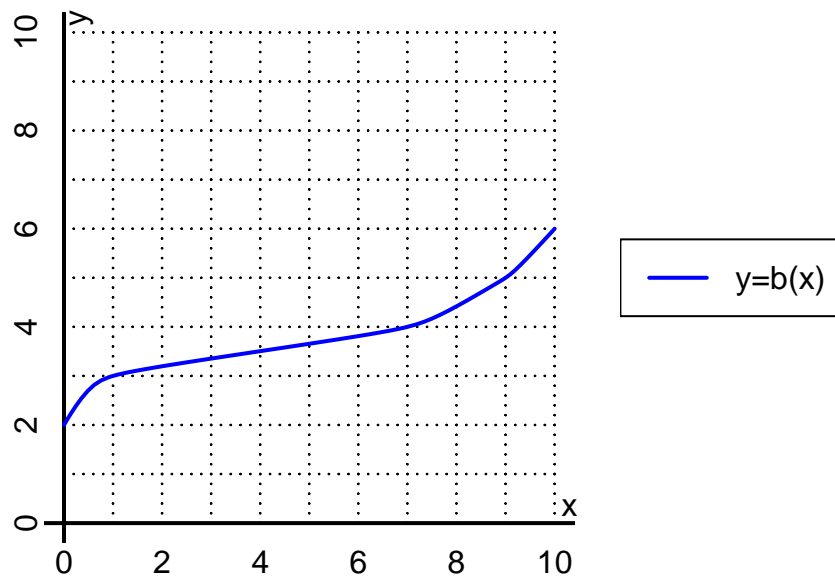$$\color{red}f(2) = 14$$

b. Evaluate $f^{-1}(38)$.

step 1: subtract 8
step 2: divide by 3

$$\color{red}f^{-1}(x) = \frac{x - 8}{3}$$
$$\color{red}f^{-1}(38) = \frac{(38) - 8}{3}$$
$$\color{red}f^{-1}(38) = 10$$

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10. (worth 6 points) The function b is represented by the curve $y = b(x)$ graphed below.

a. Evaluate $b(7)$.

$$b(7) = 4$$

b. Evaluate $b^{-1}(5)$.

$$b^{-1}(5) = 9$$

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11. (worth 18 points) Function f is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

x	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	5	-5	-5	5
-1	3	-3	3	-3
0	0	0	0	0
1	3	-3	3	-3
2	-5	5	5	-5

b. Is function f even, odd, or neither?

neither

c. How do you know the answer to part b?

Function f is neither because neither column $-f(-x)$ nor column $f(-x)$ matches column $f(x)$ exactly.